

Lower Eocene Gastropods from the El Bosque Formation, Central Chiapas, Mexico

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Abstract. Gastropods from the Lower Eocene El Bosque Formation in central Chiapas, Mexico, are reported in this contribution. Thirty-two species are described and figured, four of them are new species—*Calliostoma granulata*, *Crommium globosa*, *Lyrischapa spinifera*, and *Volutocorbis minutus*—and one new subspecies, *Palmerella mortoni mexicana*, is erected. The age for the sediments of the studied locality is redefined based on ⁸⁷Sr/⁸⁶Sr analysis of well preserved *Hercoglossa* cf. *H. ulrichi* specimens as being Ypresian (52 Ma). Stratigraphic range of most of the species here described is concordant with the age inferred from isotopic data. Paleobiogeographic affinities with the Atlantic and Gulf Coastal Provinces are also confirmed, and some have affinities with the Tethyan Province.

INTRODUCTION

In recent years, a variety of fossil invertebrates that include corals, crustaceans, and mollusks have been reported from locality IHN 1005, near Veinte de Noviembre, Depresión Central of Chiapas (Figure 1). Strata at this locality, originally thought to be part of the Middle Eocene San Juan Formation, have been dated as Early Eocene (Wilcox/Ypresian), using radiometric data from well-preserved nautiloid shells of *Hercoglossa* sp. cf. *H. ulrichi* (White, 1882). This species, described from the Midway Group of Arkansas, has a stratigraphic range of Paleocene-Lower Eocene (Miller, 1947). Several nautiloid specimens were collected from the studied locality, most of them of relatively small size (Figure 2). ⁸⁷Sr/⁸⁶Sr analysis made by one of us (Solé) yields a value of 0.707684 ± 0.000008 (25) that, according to scales of Gradstein & Ogg (1996) and Odin (1994), is approximately equivalent to 52 Ma (Figure 3). According to the stratigraphy and lithology described previously for the study area (Ferrusquía-Villafranca, 1996), we reassign locality IHN 1005 to the lower part of the El Bosque Formation.

Paleobiogeographic affinities of the fauna described are consistent with Tethyan influence.

STRATIGRAPHY AND PALEOENVIRONMENT

Continental red beds exposed in Mesa Telestaquín, Soyaló, and El Bosque were defined as the El Bosque Formation (Allison, 1967). This unit was named as the Telestaquín Mesa Sandstone by Frost & Langenheim (1974), based on more complete and accessible outcrops in the area of Soyaló. However, Ferrusquía-Villafranca

(1996) redefined this unit and suggested that the original name El Bosque Formation be preserved. Outcrops of the El Bosque Formation are scattered in the Ixtapa-Soyaló area, and the formation has been recognized in the Depresión Central of Chiapas, where Frost & Langenheim (1974) suggested that this unit is present in the Copoya syncline. Based on a few molluscan species and benthic foraminifera, Frost & Langenheim (1974) and Ferrusquía-Villafranca (1996) suggested an Early Eocene age for the El Bosque Formation. Stratigraphic distribution of eight species here reported confirm an Early Eocene age for locality IHN 1005 (Table 1). This is the first report of the El Bosque Formation in Veinte de Noviembre area, where a thickness of less than 200 m is estimated. Thickness for this unit elsewhere was reported to be between 720 and 2000 m (Frost & Langenheim, 1974; Ferrusquía-Villafranca, 1996).

At Veinte de Noviembre, the El Bosque Formation rests conformably over siltstones of the Soyaló Formation (Figure 4). The top of the sequence is marked by a coarse conglomerate. Some calcareous concretions near the top include coral remains, wood, and mollusks. The diversity of marine organisms is remarkable. Cypraeoidean gastropods and diverse crustaceans have been reported from this locality (Perrilliat et al., 2003; Vega et al., 2001). Annelid tubes, echinoids, fish remains, and rare seeds are also found.

From the paleoenvironmental point of view, Frost & Langenheim (1974) and Ferrusquía-Villafranca (1996) defined this unit as being almost completely continental. The diversity of marine species at Veinte de Noviembre suggests a coastal environment, with some major continental influence. Crustaceans represented only by cara-

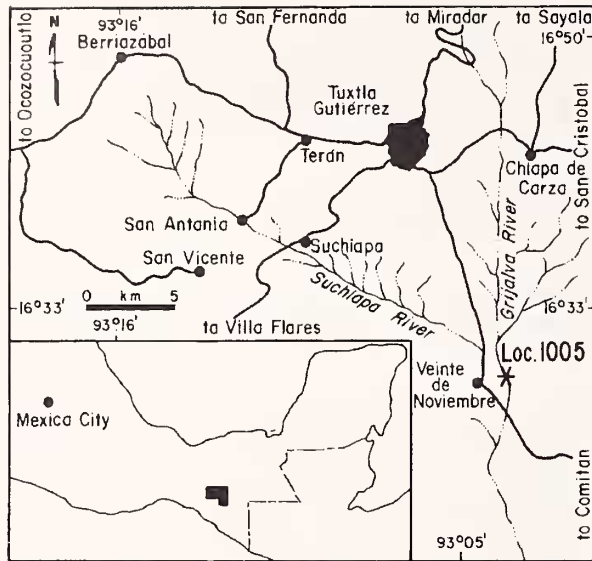


Figure 1. Location map of study area at Depresión Central, Chiapas

pace molts, with appendages or ventral parts not present, suggest at least some transport. However, delicate structures such as spines are preserved, and the transport may not have been really significant, as most carapaces are complete (Vega et al., 2001).

The studied fauna has its main affinities with gastropods reported from the Gulf Coastal Plains (Alabama, Texas, and Mississippi) and the west coast (California, Oregon, and Washington) of the United States. Only three species are common to France and England, and three species have also been reported to occur in the Mexican states of Nuevo León and Baja California Sur (Table 2).

Specimens here described are deposited in the Instituto de Historia Natural y Ecología, Chiapas, and in the Colección de Paleontología del Instituto de Geología, Universidad Nacional Autónoma de México. Types are included in the Type Collection and classified under the acronyms IHN and IGM respectively. The type locality is registered in the locality catalog of the Instituto de Historia Natural y Ecología, Chiapas.

SYSTEMATIC PALEONTOLOGY

Class Gastropoda Cuvier, 1797

Order Archaeogastropoda Thiele, 1925

Superfamily TROCHOIDEA Rafinesque, 1815

Family TROCHIDAE Rafinesque, 1815

Genus *Calliostoma* Swainson, 1840

Type species: *Trochus conulus* Linnaeus, 1758, by subsequent designation (Hermannsen, 1846:154); Recent, Mediterranean Sea.

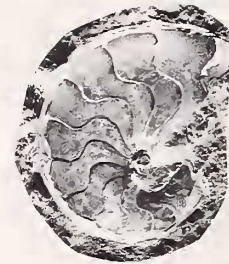


Figure 2. *Hercoglossa* sp. cf. *H. ulrichi* (White, 1882) IGM 8622 $\times 1.4$, locality IHN 1005.

Calliostoma granulata Perrilliat, Avedaño & Vega, sp. nov. (Figures 5, 6)

Diagnosis: Small *Calliostoma*; sculpture of four equally spaced, granulated spiral ribs and, from third whorl, three granulose threads, one between each rib.

Description: Shell small sized, conical. Protoconch not preserved; teleoconch of six whorls that gradually increase in size; sculpture of four equally spaced, granulated spiral ribs from suture and carina; from third whorl, three granulose threads in between these ribs. Entire surface covered by very thin radial threads. Edge of whorls finely granulated. Suture impressed. Base with spiral ribs and threads. Umbilicus deep and narrow. Aperture not preserved.

Etymology: Name for the new species refers to sculpture of granulated spiral ribs.

Types: Holotype IHN 5101, paratype IGM 8597.

Holotype: IHN 5101, height 19.4 mm, diameter 16.6 mm; paratype IGM 8597, height 15.5 mm, diameter 16.9 mm.

Discussion: The specimens from Chiapas differ from *Calliostoma (Eutrochus) clabornianum* Palmer (1944:

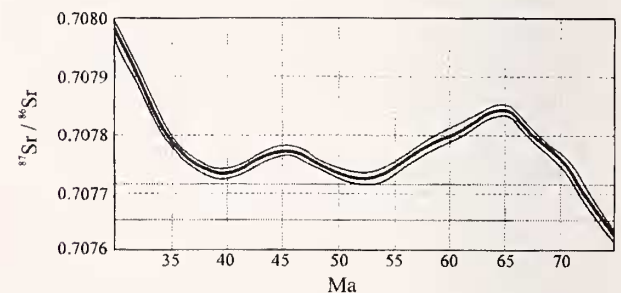


Figure 3. $^{87}\text{Sr}/^{86}\text{Sr}$ marine curve and 95% confidence interval for the upper Cretaceous–upper Eocene times (redrawn from Howarth and McArthur, 1997). The shaded area represents the range of $^{87}\text{Sr}/^{86}\text{Sr}$ determined in *Hercoglossa* sp. cf. *H. ulrichi* (White, 1882), including analytical error. Most probable age is in the range of 50–55 Ma.

Table 1

Stratigraphic distribution of previously known species from locality IHN 1005.

	Paleocene	Lower Eocene	Middle Eocene	Upper Eocene	Oligocene	Miocene
<i>Bittium (Bittium) estellensis</i>	X					
<i>Potamides tricarinatus</i>		X	X	X		
<i>Turritella humerosa sanjuanensis</i>		X				
<i>Mesalia alabamiensis</i>		X	X			X
<i>Calyptraea aperta</i>		X	X	X	X	
<i>Pachycrommium clarki</i>		X	X	X		
<i>Galeodea koureos</i>		X				
<i>Athleta petrosa petrosa</i>			X			
<i>Architectonica alabamiensis</i>		X	X			
<i>Tornatellaea bella</i>		X				

308, pl. 2, figs. 4–6), which are from the Gosport Sand, Claiborne, Alabama and very small with ornamentation of three spiral ribs and secondary spirals that increase in thickness until the last whorl, where they become five crenulated spiral ribs, and the base is covered also by spiral ribs.

Calliostoma sp. (Clark & Martin, 1901:157) from the Aquia Formation, Upper Marlboro, two miles from Potomac Creek, Maryland, is not similar to the Mexican specimens, as only its last whorl presents spiral-crenulated threads differing in thickness.

Calliostoma sp. (Kellum, 1926:26, pl. 14, fig. 7), from the Eocene (Jackson) of Wilmington, New Hanover County, and Old Rocky Point, Pender County in North Carolina, is represented by a medium-sized internal cast with elevated spire. The sculpture is unknown, and therefore it cannot be compared to the Chiapas specimens.

Genus *Trochus* Linnaeus, 1758

Type species: *Trochus maculatus* Linnaeus, 1758, by original designation; Recent, Indo-Pacific.

Trochus sp. (Figure 7)

Description: Shell small sized, conical; protoconch of one and a half whorls, smooth; teleoconch of six slightly convex whorls, with sculpture of three thick, crenulate spiral ribs and a very fine thread between each rib; fine radial ribs in whole surface; suture impressed; base with same sculpture as rest of shell; aperture not preserved.

Material examined: One specimen. IHN 5103, height 11.5 mm, diameter 8.6 mm.

Discussion: One badly preserved specimen that cannot be assigned to any species. In the Eocene of North America there are no known species assigned to this genus.

Trochus (Tectus) bourdoti Cossmann & Pissarro (1902: 155, pl. 29, figs. 8, 9, 16, 17) from the Eocene of Fresville, France, is a large species with four prominent thick

ribs, the anterior and posterior ones are thinner. The base presents seven thick ribs. The Chiapas specimen differs from the French species in being smaller in size (although the specimen illustrated in pl. 29, figs. 8, 9 is similar in size) and having ribs of equal size that are less crenulated.

Order Caenogastropoda Cox, 1959

Superfamily CERITHIOIDEA Férussac, 1819

Family CERITHIIDAE Fleming, 1822

Genus *Cerithium* Bruguière, 1789

Type species: *Cerithium adansonii* Bruguière, 1792, by tautonymy; Recent, Red Sea.

“*Cerithium*” sp.

(Figure 8)

Description: Shell large, conical, slightly elongated. Protoconch and first whorls not preserved; rest of teleoconch with six flat whorls. Sculpture of rounded, closely spaced oblique broad axial ribs, straight in early whorls and curved at last whorl; ribs of last whorl are broad and thick in its medial part with interspaces deep and narrow; suture impressed; base rounded with one spiral rib; aperture not preserved.

Material examined: One specimen. IHN 5200, height 61.5 mm, diameter 30.1 mm.

Discussion: The specimen from Chiapas is incomplete, lacking apex and aperture. Weathering has removed axial ribs from abapertural side of three whorls; visible on apertural side. Because of the incompleteness of this specimen, assignment to the genus *Cerithium* is uncertain.

“*Cerithium*” sp. differs from *Cerithium negritosense* Woods (1922:87, pl. 11, figs. 1, 2) from the Eocene Negritos Formation of Peru in having thicker and closely spaced axial ribs on every whorl; it does not present spiral sculpture.

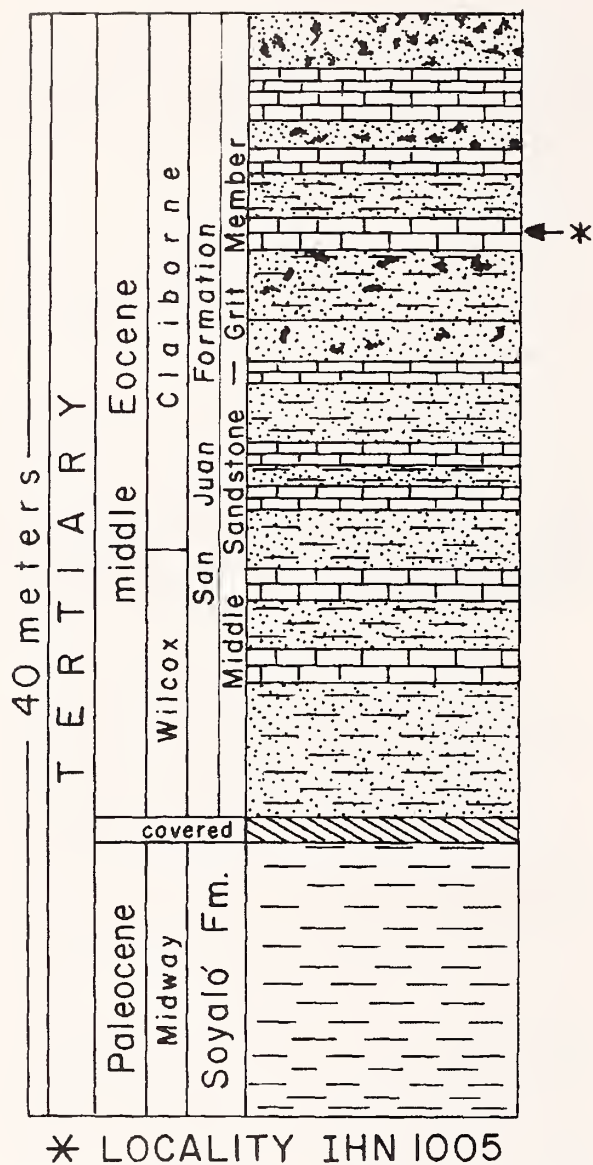


Figure 4. Stratigraphic section at Veinte de Noviembre with position of locality IHN 1005.

The Chiapas specimen is also different from *Cerithium chaperi* Bayan (1870:37, pl. 1, figs. 4, 5) from the Middle Eocene of Monte Postale, Verona, Italy, in that the latter species is more elongate, has more whorls, and lacks spiral sculpture.

Subfamily CERITHIINAE Fleming, 1822
Genus *Bittium* Leach in Gray, 1847

Type species: *Murex reticulatus* Montagu, 1803, by subsequent designation (Gray, 1847: 154); Recent, eastern North Atlantic Ocean.

Table 2

Paleobiogeographic distribution of gastropod species from locality IHN 1005.

	Mexico	USA	Europe
<i>Bittium (Bittium) estellensis</i>		Alabama Texas	
<i>Potamides tricarinatus</i>	Nuevo León		
<i>Turritella humerosa sanjuanensis</i>	Nuevo León		
<i>Mesalia alabamiensis</i>		Alabama	
<i>Calyptrea aperta</i>		Mississippi Texas	France England
<i>Pachycrommium clarki</i>	Baja California Sur	California Oregon Washington	
<i>Galeodea koureos</i>	Nuevo León	Alabama	
<i>Athleta petrosa petrosa</i>		Gulf Coast Plain	
<i>Architectonica alabamensis</i>		Alabama	
<i>Tomatella bella</i>		Alabama	

Subgenus *Bittium* s. s.

Bittium (Bittium) estellensis (Aldrich, 1921)
(Figures 9, 10)

Cerithiopsis estellensis Aldrich, 1921:15, pl. 2, fig. 11.
Bittium (Bittium) estellensis (Aldrich). Gardner, 1933:274, pl. 24, figs. 12, 13.
Bittium (Bittium) estellensis (Aldrich). Palmer & Brann, 1966:527.

Description: Shell small sized, profile flat sided; teleoconch of five whorls; suture lineal; sculpture of two primary broad nodulose spiral ribs, secondary spiral ribs between the primary rib on anterior and posterior part of whorl; a nodulose very fine thread in anterior margin. Aperture not preserved.

Material examined: Four specimens. IHN 5450, height 7.3 mm, diameter 3.8 mm; IGM 8598, height 5.4 mm, diameter 3.0 mm.

Discussion: This species was described from the Paleocene Kincaid Formation of Alabama and Texas; specimens from there achieved a larger size than the specimens of Chiapas, Mexico.

Genus *Iddingsia* Olsson, 1929

Type species: *Cerithium laeviusculum* Gabb, 1869, by original designation; Upper Eocene, Peru.

?*Iddingsia* sp.
(Figure 11)

Description: Shell medium sized, elongate; profile flat sided; protoconch and first teleoconch whorls not pre-

served; remainder three or four without sculpture; suture channeled; base not preserved.

Material examined: Six specimens. IHN 6675, height 42.2 mm, diameter 28.4 mm; IGM 8599, height 43.1 mm, diameter 25.8 mm.

Discussion: The channeled suture of the Mexican specimens suggests *Iddingsia*, but because they are incomplete, they are tentatively assigned. *?Iddingsia* sp. differs from *Iddingsia laeviuscula saladoense* (Olsson) (1929:82, pl. 4, figs. 2, 3) from the Middle Eocene Restin Formation of Quebrada Salado, Peru, in that the Mexican specimens are wider.

Family POTAMIDIDAE Adams & Adams, 1854

Subfamily POTAMIDINAE Adams & Adams, 1854

Genus *Potamides* Brongniart, 1810

Type species: *Potamides lamarckii* Brongniart, 1810, by original designation; Oligocene, Paris Basin, France.

Subgenus *Potamidopsis* Munier Chalmas, 1900

Type species: *Cerithium tricarinatum* Lamarck, 1804, by original designation; Middle Eocene, Paris Basin, France.

Potamides (Potamidopsis) tricarinatus
(Lamarck, 1804)
(Figures 12, 13)

Cerithium tricarinatum Lamarck, 1804:272.

Cerithium mutabile Lamarck, 1804:344, vélin n° 14, fig. 13.

Cerithium semicoronatum Lamarck, 1804:344, vélin n° 13, fig. 2.

Potamides (Tympantomus) semicoronatus (Lamarck).
Cossmann & Pissarro, 1902:46, pl. 16, figs. 11, 13.

Description: Shell medium sized; teleoconch with four whorls, profile flat sided; suture lineal; sculpture of three granulate spiral ribs, the posterior one being thicker than the other two; aperture not preserved.

Material examined: Two specimens, IHN 6546, height 19.9 mm, diameter 12.1 mm; IGM 8600, height 16.7 mm, diameter 11.1 mm.

Discussion: *P. tricarinatus*, *P. mutabile*, and *P. semicoronatus* have been considered the same species as they present three spiral ribs, the posterior one being thicker than the other two. These species have been described from the Middle Eocene of the Paris Basin, France.

Family TURRITELLIDAE Lovén, 1847

Genus *Palmerella* Allmon, 1996

Type species: *Turritella mortoni* Conrad, 1830, by original designation; Upper Paleocene, Maryland and Virginia, USA.

Palmerella mortoni mexicana Perrilliat, Avendaño & Vega subsp. nov.
(Figures 14–16)

Diagnosis: Medium sized *Palmerella*. On last whorl, a rounded carina present below strong carina at spiral C.

Description: Shell medium sized, four whorls preserved; whorls with convex profile; suture impressed; an angulose, strong peribasal carina present on each whorl, with spiral lines on rest of whorl; spiral lines granulated at intersection with growth lines; faint spirals below carina. On last whorl, a second rounded carina of similar thickness present below peribasal carina, four spiral threads present between these two carinae; edge of carina formed by a single spiral rib. Growth lines prosocline. Aperture unknown.

Etymology: Subspecies name refers to Mexico.

Types: Holotype IHN 5133, paratype IGM 8601.

Holotype: IHN 5133, height 36.5 mm, diameter 21.3 mm; paratype IGM 8601, height 27.8 mm, diameter 19.2 mm.

Discussion: All specimens incomplete. *Palmerella mortoni mexicana* resembles *P. m. postmortoni* (Harris) (1894:302–304, in part, fig. 1, not fig. 2) from the upper Paleocene of Alabama in pronounced carina at C but differs in that the carina of *P. m. mexicana* bears a single rib but that of *P. m. postmortoni* may be double ribbed (Allmon, 1996).

?Palmerella sp.
(Figure 17)

Description: Shell medium sized with five whorls, profile convex; rounded strong basal carina; thin spiral rib above carina on last two whorls, rest of whorl with fine spiral threads; and growth lines. Base and aperture not preserved.

Material examined: One specimen. IHN 5104, height 32.4 mm, diameter 17.2 mm.

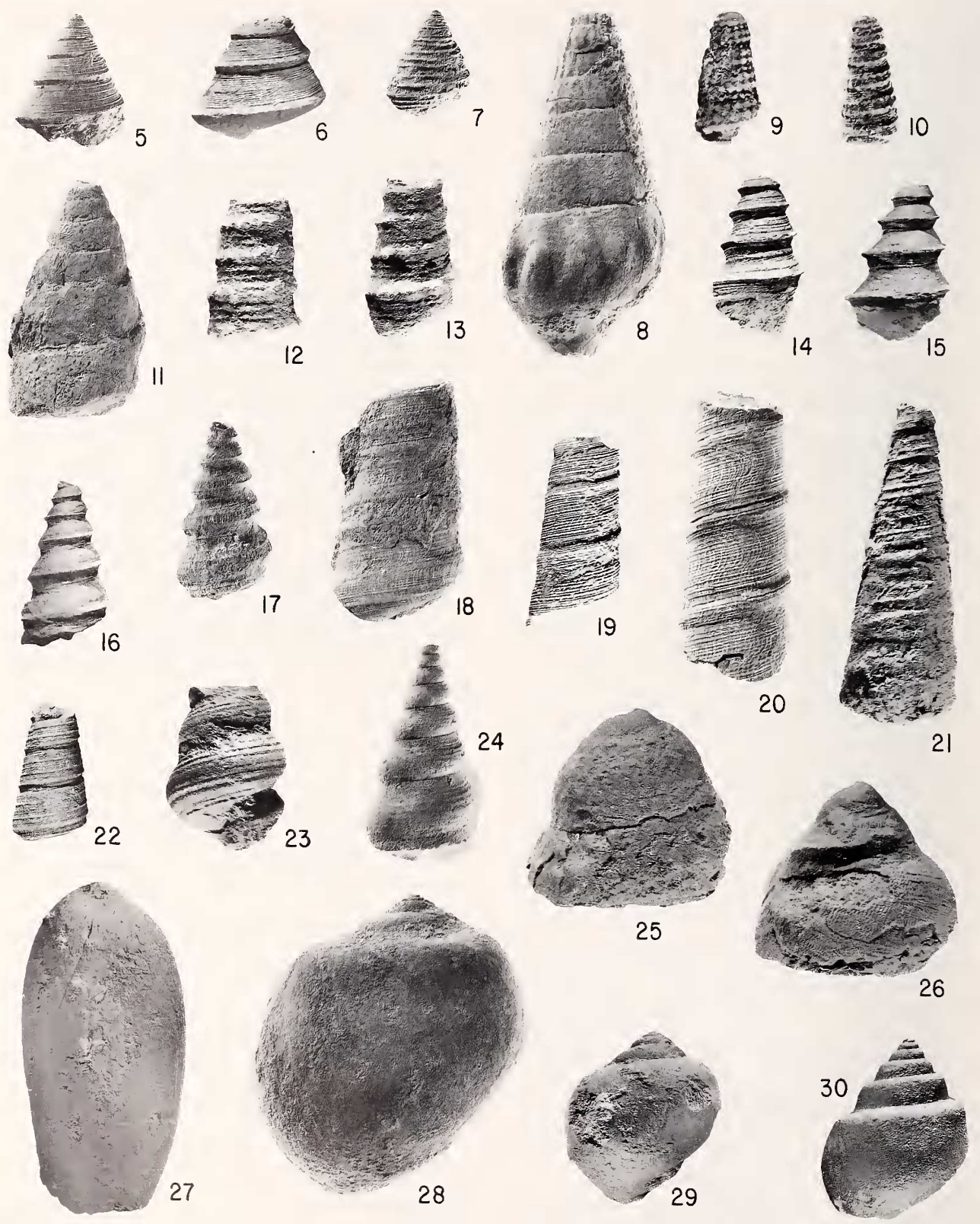
Discussion: One poorly preserved specimen, uncertainly assigned to *Palmerella*.

Genus *Haustator* Montfort, 1810

Type species: *Haustator gallious* Montfort, 1810, by original designation; Upper Eocene, England.

Haustator sp. cf. *H. rivurbana* (Cooke, 1926)
(Figure 18)

Description: Shell large sized; teleoconch of two and a half whorls; profile nearly flat sided; sutures impressed; two primary, raised, granulate ribs and a weaker spiral



rib observed; weak spiral threads intercalate between ribs; interspace broad. Aperture unknown.

Material examined: One specimen. IHN 5120, height 42.0 mm, diameter 21.6 mm.

Discussion: Specimen incomplete and compared with *Haustator rivurbana* (Cooke, 1926) from the Eocene of Mississippi in having same sculpture.

Turritella rivurbana Cooke (Harris & Palmer, 1947: 295, pl. 38, figs. 6, 7, 9, and Dockery, 1977:45–46, pl. 3, fig. 6) from the Eocene of Mississippi is represented by specimens of smaller size than the ones from Chiapas.

Turritella rivurbana chiapasensis Allison, 1969 in Allison & Adegoke, 1969:1258, pl. 147, figs. 3, 5, 6, 8, 9–12, 14; pl. 148, figs. 2, 11) and *Turritella rivurbana mexicana* Allison, 1969 in Allison & Adegoke, 1969:1259–1262, pl. 147, figs. 4, 13; pl. 148, figs. 1, 3, 4, 6, 7, 9, 10, 13, 14) from the Late Eocene of Simojovel, Chiapas, were considered synonymy of *T. rivurbana* (Allmon, 1996: 78).

Genus? (“*Turritella humerosa* group”)

“*Turritella*” *humerosa sanjuanensis* Bowles, 1939 (Figures 19, 20)

Turritella rivurbana sanjuanensis Bowles, 1939:314, pl. 34, fig. 18.

Description: Shell large sized; three whorls preserved, whorl profile almost flat sided; last whorl with 15 spirals of similar width and separated by equal interspaces; growth lines present, forming small irregular nodes at intersection with spirals. Adapical carina rounded immediately below suture, slightly convex and with five spirals. Lateral sinus moderately deep.

Material examined: Seven specimens. IHN 5770, height 50.7 mm, diameter 19.6 mm; IGM 8603, height 32.0 mm, diameter 14.5 mm.

Discussion: Holotype of *Turritella rivurbana sanjuanensis*

was described from the Lower Eocene of Río San Juan, Nuevo León (Bowles, 1939:314). Specimens from Chiapas are larger than the ones described from Nuevo León.

“*Turritella*” sp.
(Figures 21, 22)

Description: Shell large sized, four whorls of teleoconch preserved; profile flat sided; whorls with a rounded basal carina; spiral threads present between basal carina and suture; two spiral ribs on each whorl, one to two spiral threads between ribs; growth lines present.

Material examined: Three specimens. IHN 5128, height 57.5 mm, diameter 20.6 mm; IGM 8604, height 25.2 mm, diameter 16.0 mm.

Discussion: The most similar species to the Mexican specimens is *Palmerella dutexata* Harris (1895:82, pl. 9, fig. 8) from the middle Eocene of Texas. *Palmerella dutexata* Harris (illustrated in Stenzel & Turner, 1940b, pl. 46, fig. 5) is a small specimen and presents a basal carina similar to the specimens from Chiapas. The specimens from Chiapas differ from *P. dutexata* in the ornamentation of the rest of the whorl.

Genus *Mesalia* Gray, 1842

Type species: *Turritella brevis* Lamarck, 1822, by subsequent designation (Gray, 1847:155); Recent, off the coasts of northern and western Africa.

Mesalia alabamiensis (Whitfield, 1865)
(Figures 23, 24)

Potamides alabamiensis Whitfield, 1865:266, pl. 27, fig. 13; Dall, 1892:287; Whitfield, 1899:174.

Turritella vittata abruta Conrad. De Gregorio, 1890:124, pl. 11, fig. 12.

Mesalia alabamiensis Harris, 1897:25, 31; Cooke, 1926:264, pl. 94, fig. 9; Palmer, 1937:204.

←

Figures 5–30. Specimens coated with ammonium chloride. All from IHN locality 1005. Figures 5, 6. *Calliostoma granulata* Perrilliat, Avendaño & Vega, sp. nov. Figure 5. Holotype IHN 5101, $\times 1.3$. Figure 6. Paratype IGM 8597, $\times 1.4$. Figure 7. *Trochus* sp. Hypotype IHN 5103, $\times 1.7$. Figure 8. “*Cerithium*” sp. Hypotype IHN 5200, $\times 1$. Figures 9, 10. *Bittium (Bittium) estellensis* (Aldrich, 1921). Figure 9. Hypotype IGM 8598, $\times 4.4$. Figure 10. Hypotype IHN 5450, $\times 3.3$. Figure 11. *?Iddingsia* sp. Hypotype IHN 6675, $\times 1$. Figures 12, 13. *Potamides tricarlinatus* (Lamarck, 1804). Figure 12. Hypotype IGM 8600, $\times 1.5$. Figure 13. Hypotype IHN 6546, $\times 1.5$. Figures 14–16. *Palmerella mortoni mexicana* Perrilliat, Avendaño & Vega, subsp. nov. Figure 14. Paratype IGM 8601, $\times 1.1$. Figure 15. Holotype IHN 5133, $\times 0.8$. Figure 16. Paratype IGM 8602, $\times 0.9$. Figure 17. *?Palmerella* sp. Hypotype IHN 5104, $\times 1$. Figure 18. *Haustator* sp. cf. *H. rivurbana* (Cooke, 1926). Hypotype IHN 5120, $\times 1$. Figures 19, 20. *Turritella humerosa sanjuanensis* Bowles, 1939. Figure 19. Hypotype IGM 8603, $\times 1$. Figure 20. Hypotype IHN 5770, $\times 1$. Figures 21, 22. *Turritella* sp. Figure 21. Hypotype IHN 5128, $\times 1$. Figure 22. Hypotype IGM 8604, $\times 1$. Figures 23, 24. *Mesalia alabamiensis* (Whitfield, 1865). Figure 23. Hypotype IGM 8605, $\times 1.4$. Figure 24. Hypotype IHN 5107, $\times 1.5$. Figures 25, 26. *Calyptraea aperta* (Solander, in Brander, 1766). Figure 25. Hypotype IGM 8606, $\times 1.3$. Figure 26. Hypotype IHN 5201, $\times 1.4$. Figure 27. *Terebellum (Seraphis)* sp. Hypotype IHN 6684, $\times 1$. Figures 28, 29. *Crommium globosa* Perrilliat, Avendaño & Vega, sp. nov. Figure 28. Holotype IHN 5220, $\times 1$. Figure 29. Paratype IGM 8607, $\times 1$. Figure 30. *Pachycrommium clarki* (Stewart, 1927). Hypotype IHN 5145, $\times 1$.

Mesalia pumila var. *alabamiensis* Harris, 1899a:76, 77, pl. 10, fig. 9; Brann & Kent, 1960:550.

Mesalia (Mesalia) alabamiensis (Whitfield). Cossmann, 1912:126.

Mesalia alabamiensis (Whitfield). Bowles, 1939:327, pl. 34, fig. 10; Palmer & Brann, 1966:756.

Description: Shell medium sized, four whorls preserved; whorl profile convex; whorls inflated, constricted at sutures; sutures well defined; each formed by three fine spiral ribs; fine spiral threads in interspaces. First whorls with three spiral ribs; increasing to five on last whorl. Aperture unknown. Base with spiral threads. Growth lines weak.

Material examined: 15 specimens. IHN 5107, height 25.7 mm, diameter 16.6 mm; IGM 8605, height 21.1 mm, diameter 15.3 mm.

Discussion: Specimens from Chiapas are larger than the ones described from the Lower Eocene of Alabama.

Superfamily CALYPTRAEOIDEA Lamarck, 1809

Family CALYPTRAEIDAE Lamarck, 1809

Genus *Calyptraea* Lamarck, 1799

Type species: *Patella chinensis* Linnaeus, 1758, by monotypy; Recent, Europe.

Calyptraea aperta (Solander, in Brander, 1766) (Figures 25, 26)

Trochus apertus Solander, 1766, in Brander:9, pl. 1, figs. 1, 2.
Trochus opercularis Solander, 1766, in Brander:9, pl. 1, fig. 3.
Calyptraea trochiformis Lamarck, 1802:385; Dall, 1892:352.

Calyptraea aperta (Solander). Harris, 1899a:84, pl. 11, figs. 13, 16; Maury, 1912:99, pl. 13, fig. 5; Palmer, 1937:145, pl. 16, figs. 1-3, 5; Olsson, 1944:248, pl. 9, figs. 10-13; Harris & Palmer, 1947:260, pl. 31, figs. 2, 4-12.

Calyptraea (Trochatella) aperta (Solander). Olsson, 1928:62.

Calyptraea aperta (Solander in Brander). Palmer & Brann, 1966:547.

Calyptraea (Trochita) aperta (Solander in Brander). Dockery, 1977:56, pl. 5, fig. 10.

Description: Shell medium sized; protoconch of two whorls, smooth; first whorl of teleoconch smooth, following whorls with microscopic, irregular, and undulated radial striae; nodes present on radial lines. Aperture and base not preserved.

Material examined: 19 specimens. IHN 5201, height 25.7 mm, diameter 27.1 mm; IGM 8606, height 24.1 mm, diameter 27.5 mm.

Discussion: There is a wide gamut of variation in this species, from flat shells to those of considerable height. Mexican specimens are tall shells. This species has been

described from the Lower Eocene to Miocene of Alabama, Mississippi, and Texas; Eocene of Peru; and Upper Eocene of England.

The complete synonymy for this species can be found in Palmer (1937:145).

Superfamily STROMBOIDEA Rafinesque, 1815

Family STROMBIDAE Rafinesque, 1815

Genus *Terebellum* Röding, 1798

Type species: *Terebellum nebulosum* Röding, 1798, by subsequent designation (Winckworth, 1945:144); Recent, tropical western Pacific Ocean.

Subgenus *Seraphs* Montfort, 1810

Type species: *Seraphs convolutus* (Lamarck, 1802), by original designation: Eocene, Europe.

Terebellum (Seraphs) sp. (Figure 27)

Description: Shell large sized, slender; first whorls involute; last whorl incomplete; aperture extends to almost 2.0 mm from apex of first whorls; aperture lineal except on its anterior third, where it is curved, widening from medial to posterior part. Surface smooth.

Material examined: One specimen. IHN 6684, height 59.7 mm, diameter 29.2 mm.

Discussion: Only one species has been described from the eastern part of America, *Terebellum (Seraphs) belemnium* Palmer (in Richards & Palmer, 1953:25, pl. 3, figs. 9, 12) from the Inglis Member of Moodys Branch Formation of Florida, but the Chiapas specimen is larger and broader.

Terebellum (Seraphs) belemnium Palmer? (Woodring, 1959:192, pl. 25, fig. 6) from the Middle Eocene of Panama is a smaller specimen than the one from Chiapas, and the apical end of shell thins rapidly.

The specimen from Chiapas is similar to *Terebellum (Seraphs) sopitum* (Solander) Cossmann & Pissarro (1900:139, pl. 15, fig. 5) from the Middle and Upper Eocene of Fresville, France, in having similar width, but spire whorls are not involute. The following species from the Middle Eocene of France are smaller than the specimen from Chiapas: *T. olivaceum* Cossmann, 1889, *T. chilophorum* Cossmann, 1889, and *T. isabellae* Deshayes, 1865.

More complete specimens are needed to support description of a new species.

Superfamily NATICOIDEA Forbes, 1838

Family NATICIDAE Forbes, 1838

Subfamily AMPULLOSPIRINAE Cox, 1930

Genus *Crommium* Cossmann, 1888

Type species: *Ampullaria willemetii* Deshayes, 1825, by original designation; Eocene, France.

Crommium globosa Perrilliat, Avendaño & Vega,
sp. nov.
(Figures 28, 29)

Diagnosis: Large sized *Crommium*, globose, spire moderately elevated, whorls tabulate with faint spirals on tabulate portion and on last whorl.

Description: Shell large sized, thick and globose; spire moderately elevated with four whorls; whorls evenly rounded but narrowly tabulate; suture deeply impressed; shell smooth except for faint spiral ribs on tabulate portion and persistent on last whorl; aperture broad; parietal callus not preserved; umbilicus narrowly open.

Etymology: The name of the new species refers to its inflated shape.

Types: Holotype IHN 5220, paratype IGM 8607.

Holotype: IHN 5220, height 56.9 mm, diameter 50.6 mm; paratype IGM 8607, height 32.3 mm, diameter 31.9 mm.

Discussion: The specimens from Chiapas differ from *Crommium splendida* (Deshayes) (1866, p. 61, pl. 67, figs. 8–10) from the Lower Eocene of Aisy, France, in having faint spirals on tabulate portion and last whorl with ribs.

Genus *Pachycrommium* Woodring, 1928

Type species: “*Natica phasianelloides* d’Orbigny” of Guppy, 1866, by original designation; Miocene, Dominican Republic.

Pachycrommium clarki (Stewart, 1927)
(Figure 30)

“*Amauropsis alveata* (Conrad).” Arnold, 1910:114, pl. 4, fig. 21; Arnold & Anderson, 1910:71, 286, pl. 26, fig. 21; Dickerson, 1915:86, pl. 5, fig. 9.

Amaurellina (Euspirocrommium) clarki Stewart, 1927:336–338, pl. 26, figs. 8, 9; Clark, 1929, pl. 11, fig. 10; Turner, 1938:86, pl. 20, fig. 3; Weaver, 1942:345, pl. 70, figs. 10, 18; Kena & Bentson, 1944:127; Weaver & Kleinpell, 1963:188, pl. 27, fig. 15.

Amaurellina clarki Stewart, Gardner & Bowles, 1934:246, figs. 6, 8; Schenck & Keen, 1940:34, pl. 26, fig. 7; Keen & Bentson, 1944:127.

Pachycrommium (?) clarki (Stewart). Vokes, 1939:26, 175, pl. 22, figs. 11, 30; Givens, 1974:73, pl. 8, figs. 6, 10.

Amaurellina (?) multiangulata Vokes, 1939:26, 174, pl. 22, figs. 2, 8, 13.

Pachycrommium clarki (Stewart, 1927). Marincovich, 1977: 238–241, pl. 20, figs. 4–10; Squires & Demetron, 1992:32, fig. 84.

Description: Shell medium sized, elongate; protoconch not preserved; spire elevated, with six whorls; last whorl moderately inflated; first whorls rounded; shoulder becoming progressively more tabulate on last whorls; last whorl with strong tabulation; suture moderately impressed; surface smooth, except for growth lines; closed umbilicus; aperture not preserved.

Material examined: 110 specimens. IHN 5145, height 34.9 mm, diameter 27.5 mm; IGM 8608, height 30.1 mm, diameter 21.6 mm.

Discussion: This species is found in the Lower Eocene of California (Givens, 1974); the Middle Eocene of Oregon (Turner, 1938) and California (Stewart, 1927; Vokes, 1939); and the Upper Eocene of Washington (Weaver, 1943) and California (Weaver & Kleinpell, 1963). It is also found in the Eocene Bateque Formation of Baja California Sur (Squires & Demetron, 1992). It differs from *Amauropsis jacksonensis* Harris (1896b:474, pl. 19, fig. 3) of the Eocene of Jackson, Mississippi, in having a rounded shoulder and from *A. perovata* Conrad (1846:21, pl. 1, fig. 16) of the Middle Eocene of Alabama in being larger and having a well-defined shoulder.

Superfamily TONNOIDEA Suter, 1913

Family CASSIDAE Latreille, 1825

Genus *Galeodea* Link, 1807

Type species: *Buccinum echinophora* Linnaeus, 1758, by monotypy; Recent, Mediterranean Sea.

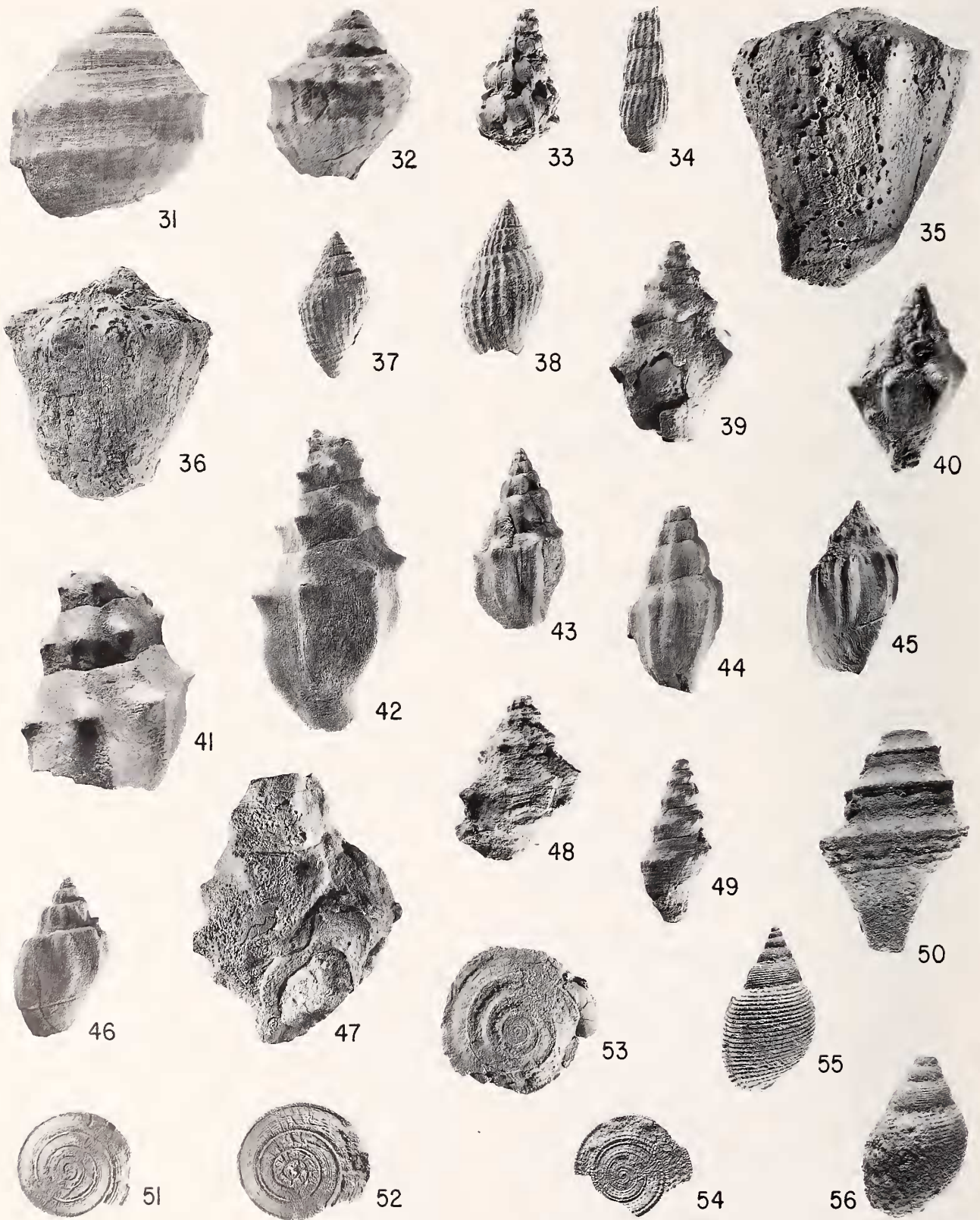
Galeodea koureos Gardner, 1939
(Figures 31, 32)

Cassidaria brevidentata Aldrich “var.” Harris, 1896b:479, pl. 22, fig. 10; Harris, 1899a:67, pl. 8, fig. 18; Harris 1899b:307.

Galeodea (Mambrinia) koureos Gardner, 1939:23; LeBlanc, 1942:111, pl. 14, figs. 5, 6.

Galeodea koureos Gardner, Palmer & Brann, 1966:695.

Description: Shell medium sized; protoconch with three whorls, smooth; teleoconch with four whorls, first whorl with six spiral threads; following whorl with three primary spiral ribs, with small nodes and two thin spiral threads in between each primary spiral rib; from next whorl, abapical spiral is more prominent and defines periphery and external edge of shoulder, where 14 nodes are present. Two thinner abapical spirals with nodes on last whorl, with thin spiral threads between these spirals; whole surface with very fine growth lines; suture impressed; aperture not preserved.



Material examined: 16 specimens. IHN 5242, height 24.8 mm, diameter 22.2 mm; IGM 8609, height 21.1 mm, diameter 18.3 mm.

Discussion: This species has been described from the Lower Eocene of Alabama and west of Los Aldamas, Nuevo León. Although Chiapas specimens are smaller, they present the three major spirals on last whorl.

Superfamily JANTHINOIDEA Lamarck, 1812

Family EPITONIIDAE Suter, 1913

Genus *Cirsotrema* Mörch, 1852

Type species: *Scalaria varicosa* Lamarck, 1822, by monotypy; Recent, Western Pacific.

Cirsotrema sp.
(Figure 33)

Description: Shell small sized; turreted, five rounded whorls preserved; sculpture of eight prosocline axial lamellae; aperture and base not preserved.

Material examined: One specimen. IHN 5241, height 12.5 mm, diameter 7.2 m.

Discussion: One poorly preserved specimen in which spiral lines are not observed on interspaces or in lamellae. It is similar to *Cirsotrema (Coroniscala) newtonensis* (Meyer & Aldrich, 1886) (Palmer, 1937:101, pl. 10, figs. 10, 11) from the Middle Eocene of Mississippi in size and number of lamellae. *Cirsotrema (Coroniscala) clai-bornensis* (Conrad, 1865) from the Middle Eocene of Alabama, *Cirsotrema (Coroniscala) octolineata* (Conrad, 1860) from the Middle Eocene of Mississippi, and *Cirsotrema (Coroniscala) lineata* (Conrad, 1860) from the Middle Eocene of Alabama all have more lamellae.

Order Neogastropoda Thiele, 1929

Superfamily MURICOIDEA Rafinesque, 1815

Family BUCCINIDAE Rafinesque, 1815

Genus *Exilia* Conrad, 1860

Type species: *Exilia pergracilis* Conrad, 1860, by original designation; Lower Eocene, Alabama, USA.

Exilia sp.
(Figure 34)

Description: Shell medium sized, high spired, fusiform; teleoconch of three barely convex whorls; sculpture of numerous flexuous axial ribs and thin spiral ribs on interspaces; suture impressed; aperture narrow; outer lip not preserved; columella smooth.

Material examined: Two specimens. IHN 5324, height 13.0 mm, diameter 4.3 mm; IGM 8610, height 8.9 mm, diameter 3.2 mm.

Discussion: The specimens from Chiapas resemble *Exilia pergracilis* Conrad (1860:291, pl. 47, fig. 34) from the Lower Eocene of Alabama in having similar sculpture and a smooth columella, but they are smaller. The first whorls, aperture, and anterior siphon are not preserved.

Family VOLUTIDAE Rafinesque, 1815

Subfamily FULGORARIINAE Pilsbry & Olsson, 1954

Genus *Lyrischapa* Aldrich, 1911

Type species: *Lyrischapa harrisi* Aldrich, 1911, by monotypy; Middle Eocene, Mississippi, USA.

←
Figures 31–56. Specimens coated with ammonium chloride. All from IHN locality 1005. Figures 31, 32. *Galeodea koureos* Gardner, 1939. Figure 31. Hypotype IHN 5242, $\times 1.5$. Figure 32. Hypotype IGM 8609, $\times 1.4$. Figure 33. *Cirsotrema* sp. Hypotype IHN 5241, $\times 2.1$. Figure 34. *Exilia* sp. Hypotype IHN 5324, $\times 2$. Figures 35, 36. *Lyrischapa spinifera* Perrilliat, Avendaño & Vega, sp. nov. Figure 35. Holotype IHN 5282, $\times 1$. Figure 36. Paratype IGM 8611, $\times 1$. Figures 37, 38. *Volutocorbis minutus* Perrilliat, Avendaño & Vega, sp. nov. Figure 37. Holotype IHN 5294, $\times 1.5$. Figure 38. Paratype IGM 8612, $\times 2.5$. Figures 39, 40. *Athleta petrosa petrosa* (Conrad, 1833). Figure 39. Hypotype IHN 5275, $\times 1$. Figure 40. Hypotype IGM 8613, $\times 1.1$. Figures 41, 42. *Lapparia* sp. cf. *L. nuda* Stenzel & Turner, 1940. Figure 41. Hypotype IGM 8614, $\times 1.6$. Figure 42. Hypotype IHN 5280, $\times 1.1$. Figures 43, 44. *Volutilithes* sp. cf. *V. muricina* (Lamarck, 1803). Figure 43. Hypotype IHN 5307, $\times 1$. Figure 44. Hypotype IGM 8615, $\times 1$. Figures 45, 46. *Sulcobuccinum* sp. cf. *S. scalina* Heilprin, 1880. Figure 45. Hypotype IGM 8616, $\times 1$. Figure 46. Hypotype IHN 5328, $\times 1$. Figure 47. *Cornulina?* sp. Hypotype IHN 5323, $\times 1$. Figure 48. *Levifusus* sp. Hypotype IHN 5326, $\times 2$. Figures 49, 50. *Turricula* sp. Figure 49. Hypotype IGM 8618, $\times 1$. Figure 50. Hypotype IHN 5366, $\times 1.3$. Figures 51, 52. *Architectonica alabamensis* (Dall, 1892). Figure 51. Hypotype IHN 5386, $\times 1.9$. Figure 52. Hypotype IGM 8619, $\times 2.5$. Figure 53. *Architectonica* sp. Hypotype IHN 5388, $\times 2$. Figure 54. *Architectonica* sp. cf. *A. elaborata* (Conrad, 1833). Hypotype IHN 5385, $\times 2.1$. Figures 55, 56. *Tornatellaea bella* Conrad, 1860. Figure 55. Hypotype IHN 6550, $\times 2.4$. Figure 56. Hypotype IGM 8620, $\times 3$.

Lyrischapa spinifera Perrilliat, Avendaño & Vega
sp. nov.
(Figures 35, 36)

Diagnosis: Medium sized *Lyrischapa* with low spire; blunt peripheral spines; columellar folds of same strength and spacing, strongest anteriorly.

Description: Shell medium sized, conical; protoconch of two smooth whorls; spire low; teleoconch of four whorls, rapidly expanding, each succeeding whorl enveloping the preceding one; each whorl with nine prominent axial ribs, which gradually develop into erect, blunted peripheral spines; spiral sculpture not preserved; suture distinct, impressed, undulated around axial ribs; aperture narrow; on inner lip, only three columellar folds visible; parietal calus thick.

Etymology: Name of the new species refers to presence of blunted spines.

Types: Holotype IHN 5282; paratype-IGM 8611.

Holotype: IHN 5282, height 50.1 mm, diameter (with spines) 45.5 mm; IGM 8611, height 42.0 mm, diameter (with spines) 37.4 mm.

Discussion: There are only three previously known species of *Lyrischapa* from the Middle Eocene of North America. *Lyrischapa harrisi* Aldrich (1911:11, pl. 4, fig. 8) from Mississippi differs from the Mexican specimens in having a larger protoconch, more rapidly expanding whorls, shorter peripheral spines, and a broader ramp.

Lyrischapa lajollaensis (Hanna) (1927:320, pl. 52, figs. 1, 2) from the Llajas Formation, California, differs in being slender and having more spines and a higher spire. *Lyrischapa chiapasensis* (Gardner & Bowles) (1934:248, figs. 10–12) from the Middle Eocene of Sayula, Chiapas, is smaller, more slender, and with upward pointed, larger, peripheral nodes.

Genus *Volutocorbis* Dall, 1890

Type species: *Volutocorbis (Volutilithes) limopsis* (Conrad, 1860), by original designation; Paleocene, Alabama, USA.

Volutocorbis minutus Perrilliat, Avendaño & Vega
sp. nov.
(Figures 37, 38)

Diagnosis: Small *Volutocorbis*; fusiform; sculpture of axial ribs and spiral ribs forming nodes.

Description: Shell small sized, fusiform; protoconch smooth, with two and a half whorls; teleoconch of four whorls with slightly convex profile; first whorls with three spiral ribs, which form nodes at intersection with axial ribs; nearly 21 axial ribs on last whorl, with nine spiral ribs forming nodes and four smooth ribs on base; inter-

spaces with fine spiral threads; suture deep; aperture narrow, three folds on columella.

Etymology: Species name refers to its relatively small size, compared with other species of this genus.

Types: Holotype IHN 5294, paratype IGM 8612.

Holotype: IHN 5294, height 16.8 mm, diameter 8.4 mm; paratype IGM 8612, height 11.2 mm, diameter 5.9 mm.

Discussion: The specimens from Chiapas are most similar to *Volutocorbis stenzeli* (Plummer) (1932:813, pl. 9, figs. 12, 13) from the Middle Eocene of Texas, but this species has more axial ribs (40) and more spiral ribs. *Volutocorbis limopsis* (Conrad, 1860:292, pl. 47, fig. 24) from the Paleocene of Alabama differs from the Mexican specimen in being larger and having 27 axial ribs. *Volutocorbis texana* Gardner (1933:235, pl. 21, figs. 1, 2) from the Paleocene of Texas is larger and has fewer axial ribs; it has the same number of spiral ribs as the specimens from Mexico.

Genus *Athleta* Conrad, 1853b

Type species: *Voluta varispina* Lamarck, 1811, by subsequent designation (Dall, 1890:75); Miocene, Aquitaine Basin, France.

Athleta petrosa petrosa (Conrad, 1833) (Figures 39, 40)

Voluta petrosa Conrad, 1833:29; Conrad, 1835:41, pl. 16, fig. 2; Lea, 1848:107; de Gregorio, 1890:63, pl. 4, figs. 50, 51, 53, 59, 60.

Volutilithes petrosa Conrad, 1854:31.

Athleta petrosa (Conrad). Smith, 1907:230.

Athleta petrosa (Conrad). Palmer, 1937:372, pl. 58, figs. 1–14; pl. 88, figs. 1, 7, 11; Harris & Palmer, 1947:391–393, pl. 53, figs. 1–4.

Athleta petrosa (Conrad, 1833). Fisher, Rodda & Dietrich, 1964:40–43, pl. 8, figs. 1, 2; pl. 10, figs. 6–10.

Description: Shell medium sized, fusiform; spire elevated; whorl profile shouldered; protoconch not preserved; teleoconch of five whorls; early whorls with broad, rounded axial ribs, narrow interspaces; nodes on intersection with axial ribs; nodes increase gradually in size, forming spines, and decrease in number on last whorl; axial and spiral lirae uniform on every whorl; lirae disappear on anterior part of last whorl; aperture narrow; two folds on columella.

Material examined: Five specimens, IHN 5275, height 23.1 mm, diameter 14.6 mm; IGM 8614, height 17.1 mm, diameter 11.0 mm.

Discussion: A broadly distributed species on the Atlantic and Gulf Coastal Plains. Complete synonymy in Fisher, Rodda & Dietrich, 1964:40–42.

Genus *Lapparia* Conrad, 1855

Type species: *Mitra dumosa* Conrad, 1854, by monotypy; Eocene, Mississippi, USA.

Lapparia sp. cf. *L. nuda* Stenzel & Turner, 1940a
(Figures 41, 42)

Description: Shell large, heavy, subfusiform; only three whorls of teleoconch preserved; sculpture of axial ribs that persist to last whorl and nodes that gradually develop into spines; seven nodes per whorl; ribs narrow and interspaces broad; no spiral sculpture; a steeply sloping noded shoulder near middle of spire whorls; columella with three folds; aperture not preserved.

Material examined: Two specimens. IHN 5280, height 54.3 mm, diameter 28.0 mm; IGM 8614, height 25.9 mm, diameter 20.7 mm.

Discussion: The Mexican specimens are similar to *Lapparia nuda* Stenzel & Turner (1940a:808, pl. 44, figs. 6, 9) from the Middle Eocene of Texas, but are larger in size, with persistent ribs on last whorl and fewer spines.

Genus *Volutilithes* Swainson, 1831

Type species: *Voluta muricina* Lamarck, 1803, by subsequent designation (Dall, 1906:143); Middle Eocene, Paris Basin, France.

Volutilithes sp. cf. *V. muricinus* (Lamarck, 1803)
(Figures 43, 44)

Description: Shell medium sized, fusiform; protoconch not preserved; teleoconch with five whorls; convex profile; first whorl with nine rounded axial ribs, interspaces twice the width of the ribs; following whorls with seven axial ribs; last whorl with acute periphery and spines on apex of axial ribs; no spiral sculpture; suture undulated; aperture not preserved; columella with three folds.

Material examined: 16 specimens. IHN 5307, height 32.5 mm, diameter 16.0 mm; IGM 8615, height 31.4 mm, diameter 16.4 mm.

Discussion: The specimens from Chiapas are similar to *Volutilithes muricinus* (Lamarck, 1803) from the Middle Eocene of France in their sculpture, but the Mexican specimens are smaller.

Family PSEUDOLIVIDAE de Gregorio, 1880

Genus *Sulcobuccinum* d'Orbigny, 1850

Type species: *Buccinum fissuratum* Deshayes, 1835, by subsequent designation (Vermeij, 1998:60); Upper Paleocene, France.

Sulcobuccinum sp. cf. *S. scalina* Heilprin, 1880
(Figures 45, 46)

Description: Shell medium sized, ovate; protoconch of two whorls, paucispiral; teleoconch of five whorls with shoulder; spiral sculpture of fine threads on first whorls of teleoconch; axial sculpture of 11 ribs, on last whorl reaching pseudolivid groove, forming nodes on shoulder; suture deeply channeled; base of last whorl below groove, smooth; aperture ovate.

Material examined: 60 specimens. IHN 5328, height 26.9 mm, diameter 15.6 mm; IGM 8616, height 31.9 mm, diameter 17.2 mm.

Discussion: The specimens from Chiapas are different from *Sulcobuccinum scalina* (Heilprin) (1880:371, pl. 20, fig. 12) from the Lower Eocene of Alabama in being smaller and lacking spiral threads below groove. Probably these specimens represent two different species.

The classification suggested by Vermeij (1998:60) is followed in this work.

Family MELONGENIDAE Gill, 1871

Genus *Cornulina* Conrad, 1853

Type species: *Cornulina armigera* Conrad, 1833, by subsequent designation (Fischer, 1884:621); Middle Eocene, Alabama, USA.

Cornulina? sp.
(Figure 47)

Description: Shell large sized, heavy; two whorls preserved; last whorl with two lines of short, equal sized spines; no spiral sculpture; suture undulated; aperture not preserved.

Material examined: One specimen. IHN 5323, height 49.3 mm, diameter 40.8 mm.

Discussion: Assignment to this genus is tentative because of the incompleteness of the specimen. Similarity to *Cornulina* is based on sculpture of last whorl, which has two lines of spines reminiscent of *Cornulina*, but the spire of this specimen is higher.

Genus *Levifusus* Conrad, 1865

Type species: *Fusus trabeatus* Conrad, 1833, by subsequent designation (Cossmann, 1901:14); Eocene, Alabama, USA.

Levifusus sp.
(Figure 48)

Description: Shell small sized; protoconch not preserved; first whorl of teleoconch with eight widely spaced and rounded axial ribs, overrun by spiral ribs on whole whorl; following whorls with carina and 10 axial ribs; on last

whorl, a strong carina near mid whorl and a weaker one below it; spiral ribs and spiral threads between these two carinae; aperture not preserved.

Material examined: Two specimens. IHN 5326, height 14.3 mm, diameter 12.0 mm; IGM 8617, height 16.0 mm, diameter 9.4 mm.

Discussion: Two incomplete specimens are similar to *Levifusus mortoniopsis carexus* (Harris) (1895:72, pl. 7, fig. 5) from the Eocene of Texas. Although the Mexican specimens are smaller, they have the same number of axial ribs, carina, and spiral ribs as the Texan specimens.

Superfamily CONOIDEA Rafinesque, 1815

Family TURRIDAE Adams & Adams, 1858

Subfamily TURRICULINAE Powell, 1942

Genus *Turricula* Schumacher, 1817

Type species: *Murex tornatus* Dillwyn, 1817, by monotypy; Recent, Indo-Pacific.

Turricula sp.
(Figures 49, 50)

Description: Shell medium sized, slender; protoconch not preserved; teleoconch of five whorls; ramp slightly inclined and covers half of teleoconch whorl; surface bearing trace of labial sinus; shoulder prominent with 10 nodes; 18 spiral threads between shoulder and suture; threads disappear on base of siphonal neck.

Material examined: Seven specimens. IHN 5366, height 28.6 mm, diameter 12.4 mm; IGM 8618, height 27.4 mm, diameter 12.3 mm.

Discussion: The specimens from Chiapas are not similar to any species described from the Eocene of the Atlantic Coast of the United States.

Pleurofusua raricosta (Gabb) (1864:93, 223, pl. 18, fig. 47) from the Eocene of California is a similar species with eight axial ribs terminating abruptly as slightly twisted nodes at shoulder. The Mexican specimens are similar to *Turricula emerita* Hickman (1976:36, pl. 1, figs. 14–18) from the Lower Oligocene of Oregon in shape and sculpture.

Order Heterostropha Fischer, 1885

Superfamily ARCHITECTONICOIDEA Gray, 1840

Family ARCHITECTONICIDAE Gray, 1850

Genus *Architectonica* Röding, 1798

Type species: *Architectonica perspectiva* Röding, 1798 (by subsequent designation, Gray, 1847:151); Recent, tropical western Pacific Ocean.

Architectonica alabamensis (Dall, 1892)
(Figures 51, 52)

Solarium alabamense Dall, 1892:324, pl. 22, fig. 17; Harris, 1896a:114, pl. 12, fig. 4; Brann & Kent, 1960:803.
Architectonica alabamensis (Dall). Palmer & Brann, 1966:498.

Description: Shell small sized, discoidal; protoconch of one and a half whorls, smooth; teleoconch with four whorls, first whorls with four spiral ribs increasing to eight on last whorl; growth lines not visible; flank of last whorl vertical with three strong, elevated ribs and two spiral threads between each rib; base with eight spiral ribs.

Material examined: Two specimens. IHN 5386, height 5.7 mm, diameter 11.2 mm; IGM 8619, height 4.5 mm, diameter 8.9 mm.

Discussion: The specimens from Chiapas do not clearly present growth lines and are larger than specimens described from Alabama.

Architectonica sp. cf. *A. elaborata* (Conrad, 1833)
(Figure 54)

Description: Shell small sized, convex; protoconch of two whorls, smooth; teleoconch of three whorls, with sculpture of crenulated ribs alternating with spiral threads on adapical surface; base of shell with eight spiral ribs, one thickest at edge; aperture not preserved.

Material examined: One specimen. IHN 5385, height 4.6 mm, diameter 10.1 mm.

Discussion: One poorly preserved specimen with crenulated sculpture and small size similar to *Architectonica elaborata* (Conrad) (1833:344) from the Middle Eocene of Alabama.

Architectonica sp.
(Figure 53)

Description: Shell small sized, discoidal; teleoconch of five whorls; sculpture of one strongly adapical rib to suture, rest of whorl smooth; margin with thick crenulations; umbilicus deep and wide.

Material examined: One specimen. IHN 5388, height 6.8 mm, diameter 14.0 mm.

Discussion: One poorly preserved specimen with a thick rib preserved; it differs from previously described specimens in having thick crenulations on the whorl periphery.

Order Cephalaspidea Fischer, 1883

Superfamily ACTEONOIDEA Cernohorsky, 1972

Family ACTEONIDAE d'Orbigny, 1842

Genus *Tornatellaea* Conrad, 1860

Type species: *Tornatellaea bella* Conrad, 1860, by monotypy; Lower Eocene, Alabama, USA.

Tornatellaea bella Conrad, 1860
(Figures 55, 56)

Tornatellaea bella Conrad, 1860:294, pl. 47, fig. 23; Conrad, 1866:9; de Gregorio, 1890:166, pl. 16, fig. 19; Cossmann, 1893:49; Cossmann, 1896:148, 150; Harris, 1899a:6, pl. 1, fig. 6; Harris & Palmer, 1947:460, pl. 64, fig. 10; Brann & Kent, 1960:869; Palmer & Brann, 1966:953; Toulmin, 1977:230, pl. 29, fig. 1.

Tornatella (Tornatellaea) bella Conrad. Heilprin, 1879:22.
Actaeon (Tornatellaea) bella Conrad. Harris, 1896a:74, in part.

Description: Shell small sized, ovate; protoconch not preserved; teleoconch of six whorls; sculpture of prominent flat spiral ribs with narrow, punctuated interspaces; eight ribs on penultimate whorl and 23 ribs on last whorl; outer lip thick; columella with two prominent oblique folds.

Material examined: 20 specimens. IHN 6550, height 12.0 mm, diameter 7.1 mm; IGM 8620, height 9.6 mm, diameter 6.0 mm.

Discussion: *Tornatellaea bella* has been described from the Lower Eocene of Alabama. *T. lata* (Conrad) (1834: 4) from the Middle Eocene of Alabama is more globose and has fewer spiral ribs.

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